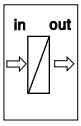
Operating Instructions

VEGATOR 631 Ex

Signal conditioning instrument

Signal
conditioning instruments
and communication



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Supplementary documentation

Information:
Supplementary documents appropriate to the ordered version come with the delivery. You can find them listed in chapter "*Product description*".

1 About this document

1.1 Function

This operating instructions manual provides all the information you need for mounting, connection and setup as well as important instructions for maintenance and fault rectification. Please read this information before putting the instrument into operation and keep this manual accessible in the immediate vicinity of the device.

1.2 Target group

This operating instructions manual is directed to trained qualified personnel. The contents of this manual should be made available to these personnel and put into practice by them.

1.3 Symbolism used

Information, tip, note
This symbol indicates helpful additional information.

Caution: If this warning is ignored, faults or malfunctions can result.
Warning: If this warning is ignored, injury to persons and/or serious damage to the instrument can result.
Danger: If this warning is ignored, serious injury to persons and/or destruction of the instrument can result.

Ex applications
This symbol indicates special instructions for Ex applications.

- **List**
  The dot set in front indicates a list with no implied sequence.

→ **Action**
This arrow indicates a single action.

1 **Sequence**
Numbers set in front indicate successive steps in a procedure.

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2 For your safety

2.1 Authorised personnel

All operations described in this operating instructions manual must be carried out only by trained specialist personnel authorised by the plant operator.

During work on and with the device the required personal protective equipment must always be worn.

2.2 Appropriate use

VEGATOR 631 Ex is a universal signal conditioning instrument for connection of a level switch.

You can find detailed information on the application range in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden.

2.3 Warning about misuse

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or adjustment.

2.4 General safety instructions

This is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards as well as all prevailing safety regulations and accident prevention rules.

The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for trouble-free operation of the instrument.

During the entire duration of use, the user is obliged to determine the compliance of the required occupational safety measures with the current valid rules and regulations and also take note of new regulations.

2.5 CE conformity

This device fulfills the legal requirements of the applicable EC guidelines. By attaching the CE mark, VEGA provides a confirmation of successful testing. You can find the CE conformity declaration in the download area of www.vega.com.

2.6 Safety instructions for Ex areas

Please note the Ex-specific safety information for installation and operation in Ex areas. These safety instructions are part of the operating instructions manual and come with the Ex-approved instruments.

2.7 Environmental instructions

Protection of the environment is one of our most important duties. That is why we have introduced an environment management system with the goal of continuously improving company environmental protection. The environment management system is certified according to DIN EN ISO 14001.

Please help us fulfil this obligation by observing the environmental instructions in this manual:

- Chapter "*Packaging, transport and storage*"
- Chapter "*Disposal*"

3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- VEGATOR 631 Ex signal conditioning instrument
- Transparent cover (lead-sealable)
- Terminal socket
- Bridges (4 pieces)
- Coded pins (2 pieces)
- Ex label
- Ex separating chamber
- Documentation
  - this operating instructions manual
  - Ex-specific "*Safety instructions*" (with Ex-versions)
  - if necessary, further certificates

Components

VEGATOR 631 Ex consists of:

- VEGATOR 631 Ex signal conditioning instrument

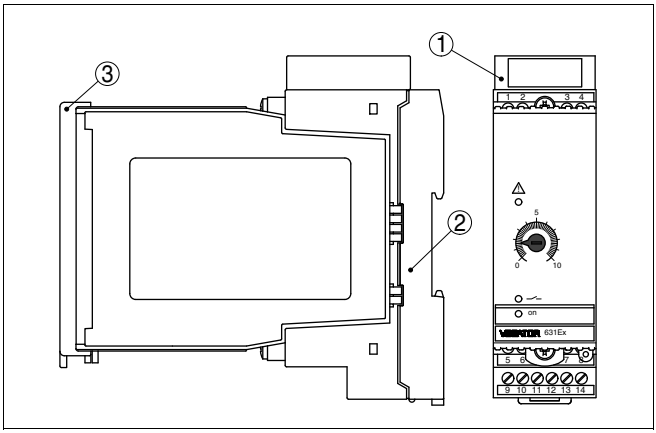

Fig. 1: VEGATOR 631 Ex

1 Ex separating chamber with Ex version
2 Terminal socket
3 Transparent cover

Type label

The type label contains the most important data for identification and use of the instrument:

- Article number
- Serial number
- Technical data
- Article numbers documentation

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The serial number allows you to access the delivery data of the instrument via www.vega.com, "*VEGA Tools*" and "*serial number search*".

3.2 Principle of operation

Application area

VEGATOR 631 Ex is a single signal conditioning instrument for processing the signals of conductive probes.

Functional principle

The VEGATOR 631 Ex signal conditioning instrument powers connected sensors and simultaneously processes their measuring signals.

When the medium reaches the switching point of the sensor, the voltage between sensor and VEGATOR 631 Ex drops. The output relays then switch according to the set mode.

Power supply

Detailed information about the power supply can be found in chapter "*Technical data*".

3.3 Operation

The integration time and the mode (A/B) can be preset via a DIL switch block on the signal conditioning instrument.

A potentiometer for adjustment the switching point is located on the front panel of VEGATOR 631 Ex.

3.4 Packaging, transport and storage

Packaging

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test according to DIN EN 24180.

The packaging of standard instruments consists of environment-friendly, recyclable cardboard. For special versions, PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.

Transport

Transport must be carried out under consideration of the notes on the transport packaging. Nonobservance of these instructions can cause damage to the device.

Transport inspection

The delivery must be checked for completeness and possible transit damage immediately at receipt. Ascertained transit damage or concealed defects must be appropriately dealt with.

Storage

Up to the time of installation, the packages must be left closed and stored according to the orientation and storage markings on the outside.

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Unless otherwise indicated, the packages must be stored only under the following conditions:

- Not in the open
- Dry and dust free
- Not exposed to corrosive media
- Protected against solar radiation
- Avoiding mechanical shock and vibration

Storage and transport temperature

- Storage and transport temperature see chapter "*Supplement - Technical data - Ambient conditions*"
- Relative humidity 20 … 85 %

4 Mounting

4.1 General instructions

Installation location

VEGATOR 631 Ex signal conditioning instrument with plug-in socket for mounting on carrier rail according to EN 50022.

Transparent cover

The front plate of VEGATOR 631 Ex can be provided with a lead-sealable transparent cover to protect the instrument against unauthorised or inadvertent adjustment. See the following figure on how to remove the transparent cover.

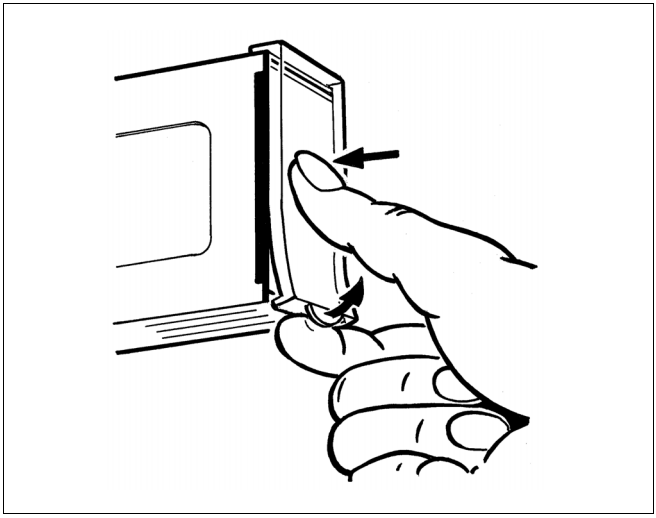

Fig. 2: Removing the transparent cover

Housing IP 65

For moisture-protected mounting outside the switching cabinet, we offer an insulated protective housing with transparent cover (IP 65) for surface mounting.

In this housing you can mount a maximum of 3 instruments of 36 mm width.

4.2 Mounting instructions

Mounting

The plug-in socket is constructed for carrier rail mounting according to EN 50022. Power supply is connected to terminals 9 and 10. For neighbouring signal conditioning instruments, it is possible to continue connection L1 and N directly via the supplied bridges.

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Danger:
The bridges must never be used with single instruments or at the end of a row of instruments. If this rule is not heeded, there is a danger of coming into contact with the operating voltage or causing a short circuit.

A VEGATOR 631 Ex in Ex version is an auxiliary, intrinsically safe instrument and must not be installed in explosion-endangered areas.

Ex separating chamber

Before setup, the Ex separating chamber must be attached (as shown below) with Ex versions. Safe operation can be only ensured if the operating instructions manual and the EG type approval certificate are observed. VEGATOR 631 Ex must not be opened.

Close the upper terminals according to the following illustration.

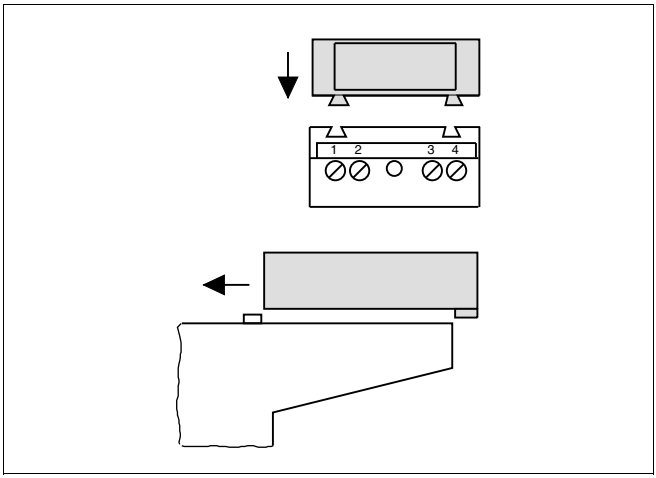

Fig. 3: Mounting the separating chamber

Instrument coding

All signal conditioning instruments are provided with different gaps dependent on type and version (mechanical coding).

The plug-in socket is provided with coded pins that can be inserted to prevent accidental interchanging of the various instrument types.

With a VEGATOR 631 Ex in Ex version, the supplied coded pins (type coded pin and Ex coded pin) must be inserted by the user according to the below chart.

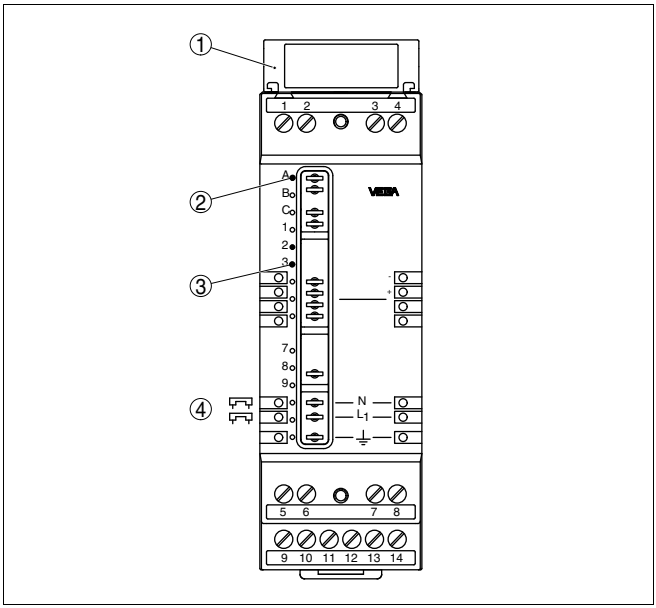

Fig. 4: Plug-in socket VEGATOR 631 Ex

1 Ex separating chamber
2 Ex coding with Ex version (A)
3 Type coding for VEGATOR 631 Ex (3)
4 Bridges for looping the operating voltage

5 Connecting to power supply

5.1 Preparing the connection

Note safety instructions

Always keep in mind the following safety instructions:

- Connect only in the complete absence of line voltage
- If overvoltage surges are expected, overvoltage arresters should be installed

Tip:
We recommend VEGA overvoltage arresters B61-300 (power supply VEGATOR 631 Ex) and B62-36G (sensor supply).

Take note of safety instructions for Ex applications

In hazardous areas you should take note of the appropriate regulations, conformity and type approval certificates of the sensors and power supply units.

Select power supply

The power supply can be 20 … 253 V AC, 50/60 Hz or 20 … 72 V DC.

Selecting connection cable

Power supply of VEGATOR 631 Ex is connected with standard cable according to the national installation standards.

The sensors are connected with standard two-wire cable without screen. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used.

Cable screening and grounding

From a cable length of 50 m use one cable for each signal conditioning instrument.

If you are using a common cable, the min. and max. cables must be screened. The screen must be connected the ground on both sides.

Select connection cable for Ex applications

Take note of the corresponding installation regulations for Ex applications.

5.2 Connection procedure

Move on to electrical connection and proceed as follows:

1 Snap the socket without VEGATOR 631 Ex onto the carrier rail
2 Connect the sensor cable to terminal 1 and 3 (see the following wiring plans)
3 Connect power supply (switched off) to terminal 9 and 10
4 Insert VEGATOR 631 Ex into the plug-in socket and screw it down tightly

The electrical connection is finished.

Before setting up Ex versions, make sure the Ex separating chamber is plugged (above the sensor terminals). The pins for type and Ex coding must also be inserted correctly.

5.3 Wiring plan

Limit level measurement

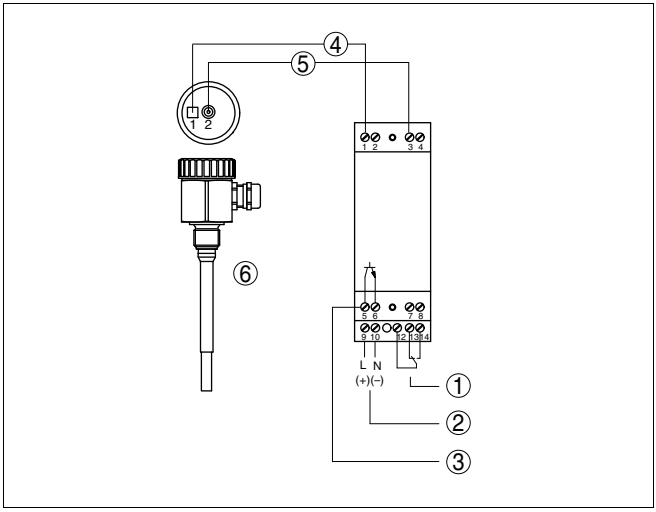

Fig. 5: Limit level measurement

1 Relay output
2 Power supply
3 Transistor output
4 Mass
5 max.
6 Probe, e.g. EL1

Two-point control (min./ max. control)

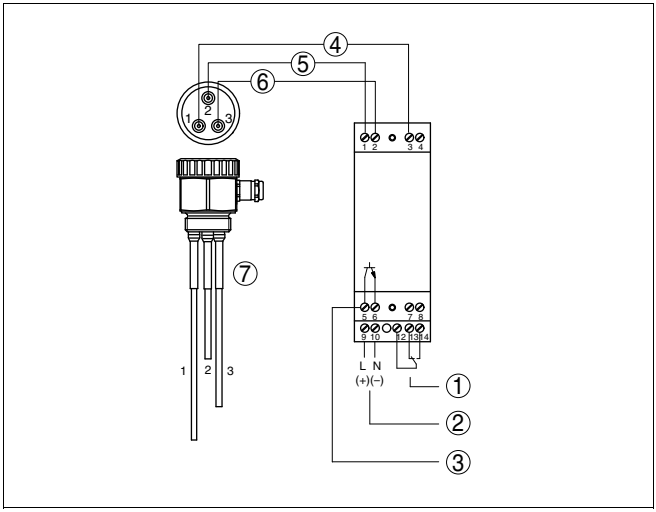

Fig. 6: Two-point control

1 Relay output
2 Power supply
3 Transistor output
4 Mass
5 Max.
6 Min.
7 Probe, e.g. EL3

Note:
Mutiple rod probes connected to several signal conditioning instruments or to a multiple channel instrument need a ground rod to keep the signal conditioning instruments from influencing each other.

Two-point control (min./ max.) with overfill protection

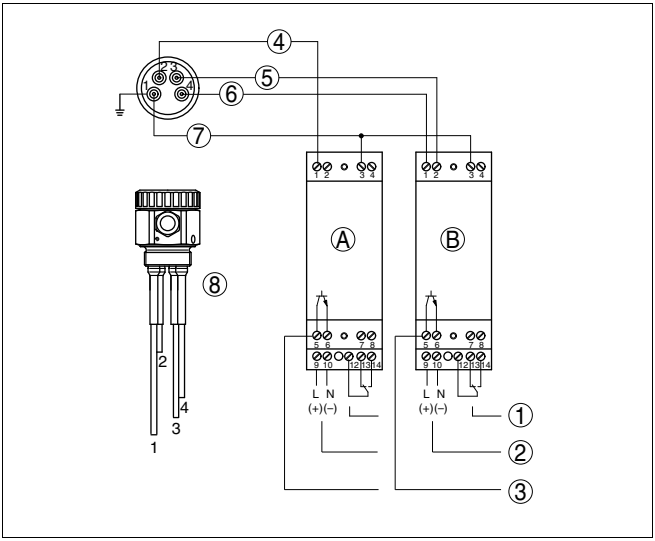

Fig. 7: Two-point control with overfill protection

1 Relay output
2 Power supply
3 Transistor output
4 Max. overfill protection
5 Min.
6 Max.
7 Mass
8 Probe, e.g. EL3
A Overfill protection
B Min./max. control

Circuit of the transistor outputs

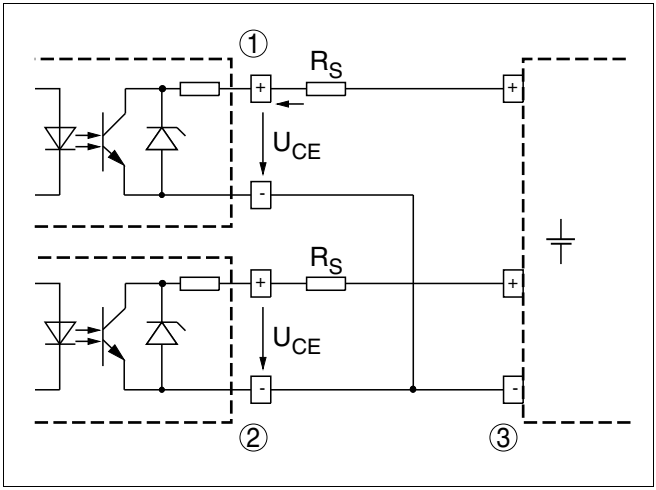

Fig. 8: Circuit of the transistor outputs

1 VEGATOR 631 Ex
2 VEGATOR 631 Ex
3 PLC

The resistor R_S serves as short-circuit protection.

R_S	P
47 Ω	0.25 W
150 Ω	0.75 W
330 Ω	1.5 W
560 Ω	2.2 W

6 Set up

6.1 Adjustment system

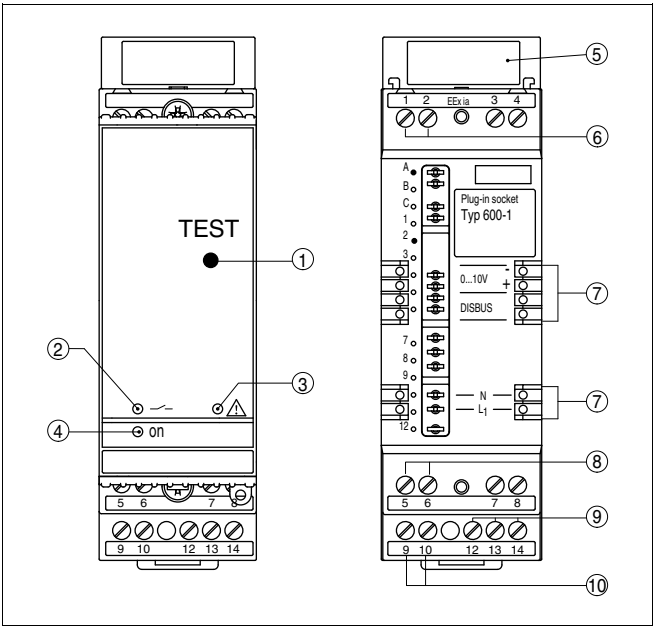

Fig. 9: Indicating and adjustment elements

1 Control lamp - Fault signal (LED red)
2 Potentiometer for switching point adjustment
3 Control lamp - Output (LED yellow)
4 Control lamp - Power supply (LED green)
5 Bridge for adjusting the fault signal
6 Terminals for probe
7 Function coding Ex version
8 Instrument coding
9 Sockets for bridges
10 Transistor output
11 Relay output
12 Power supply

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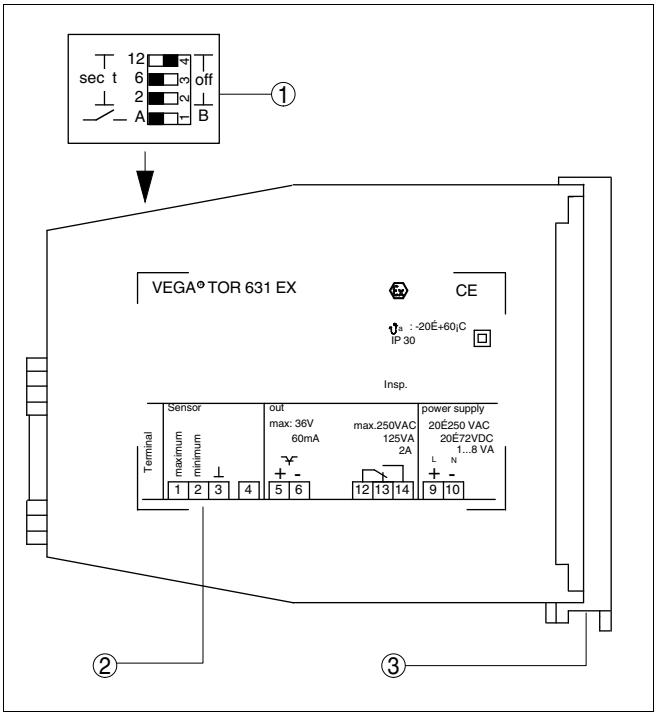

Fig. 10: Indicating and adjustment elements

1 DIL switch block
2 Type label
3 Transparent cover

6.2 Adjustment elements

Control lamps

Control lamps (LED) in the front plate indicate operation, switching status and fault signal.

- Green
  - Operating control lamp
  - Mains voltage on, instrument is operating
- Red
  - Failure lamp
  - Fault on the sensor circuit due to sensor failure or line break
  - The relay deenergises in case of failure
- Yellow
  - Relay control lamp
  - The yellow relay control lamp reacts depending on the set mode (A/B)

- Generally the relay control lamp shows the activated (energized) condition of the relay
- A dark relay control lamp means that the relay is deenergised (transistor blocks)

Potentiometer for switching point adjustment

A potentiometer for switching point adaptation is located on the front plate of the signal conditioning instrument. With this potentiometer you can adapt the measuring system to the conductivity of the product.

DIL switch block

On top to the side (covered when mounted) there is a DIL switch block with four switches. The individual switches are assigned as follows:

- 1 - A/B mode
  - A - Max. detection or overflow protection
  - B - Min. detection or dry run detection
- 2 - Integration time 2 s
- 3 - Integration time 6 s
- 4 - Integration time 12 s

With switch 1 you can adjust the mode (A - overfill protection or B - dry run protection).

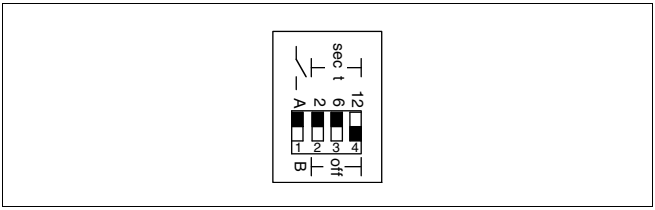

Fig. 11: DIL switch block

In the example (see previous illustration), mode A (max. detection or overfill protection) is selected (switch 1). The integration time is set to 8 seconds (switch 2, 3 and 4).

You can adjust the integration time accordingly with switch 2, 3 and 4. The time periods of the activated time switches add up. The set time applies to the switch on as well as the switch off delay.

Switch	**1**	**2**	**3**	**4**
Time		**2 s**	**6 s**	**12 s**
0.2 s	A/B	off	off	off
2 s	A/B	on	off	off
6 s	A/B	off	on	off
8 s	A/B	on	on	off
12 s	A/B	off	off	on
14 s	A/B	on	off	on
18 s	A/B	off	on	on
20 s	A/B	on	on	on

Fault signal adjustment, bridge

To implement line monitoring, you have to mount a resistor of 220 kΩ between terminals 1 and 2 in the connection housing of the probe. This means that with single point control, the measuring and ground electrode are monitored and with two-point control, the max. and ground electrode.

When a fault message is generated, the switching output is simultaneously activated.

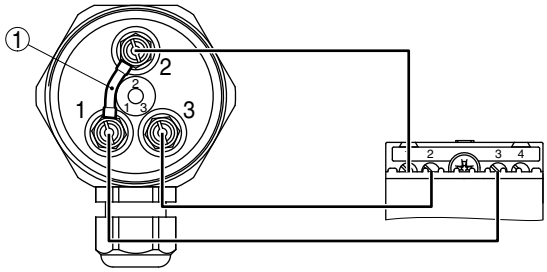

*Fig. 12: Measuring system **with** line monitoring*

1 Resistor (220 kΩ)

If a fault message is not wanted, a bridge must be provided on the signal conditioning instrument instead of the resistor in the connection housing of the probe.

Note:
The line monitoring and the fault signal are inactive with this bridge.

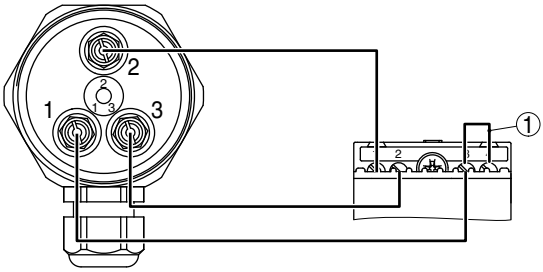

*Fig. 13: Measuring system **without** line monitoring*

1 Bridge between terminal 3 and 4

If a measuring system is used as part of an overfill protection system, the bridge on the signal conditioning instrument must not be closed. With Ex probes, the resistor in the probe housing is already present.

You can find the electrical connection of VEGATOR 631 Ex in the operating instructions manual of the corresponding signal conditioning instrument.

Line monitoring

With Ex versions, this 220 kΩ resistor is already integrated ex factory in the connection housing of the probe. The Ex measuring system (max. and ground connection cable of the probe to the signal conditioning instrument) is generally monitored for line break.

Mode switch

You can set mode A or B by means of the selection switch.

Mode A
Preferrably as overflow protection, compulsory as overfill protection.

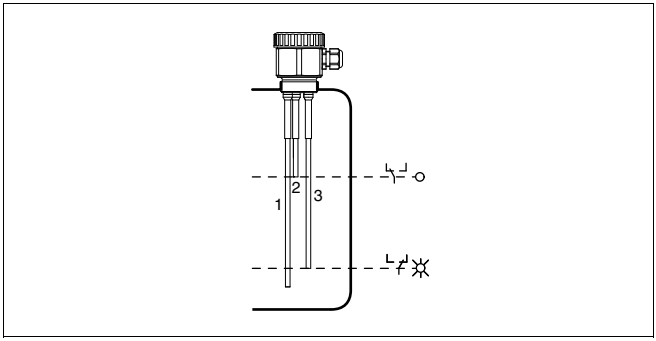

Fig. 14: Mode A - Overfill protection

Means with covered max. electrode:

- Relay deenergises, connection 12 - 13 is connected through relay
- Transistor output blocks
- Control lamp - Output extinguishes

Means with uncovered max. electrode (level detection) or min. electrode (two-point control):

- Relay energises, connection 12 - 14 is connected through relay
- Transistor output is conductive
- Control lamp - Output lights

Mode B
Preferrably as dry run protection system.

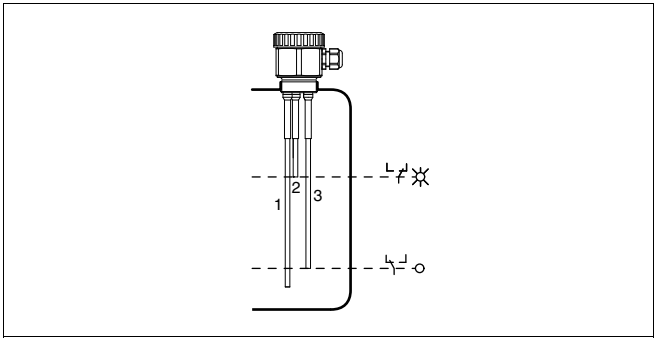

Fig. 15: Mode B - Dry run protection

Means with covered max. electrode:

- Relay energises, connection 12 - 14 is connected through relay
- Transistor output is conductive
- Control lamp - Output lights

Means with uncovered max. electrode (level detection) or min. electrode (two-point control):

- Relay deenergises, connection 12 - 13 is connected through relay
- Transistor output blocks
- Control lamp - Output extinguishes

6.3 Switching point adjustment

Note:
Keep in mind for all switching point adjustments that, between the momenet when the switching point is reached and the momenet when the switching function is triggered, there is an integration time of 0.5 sec. The potentionmeter must therefore be turned slowly.

A possible additional integration time should only be switched on after the adjustment.

Line monitoring

In all following applications in conjunction with an integrated resistor of 220 kΩ, line monitoring of the ground and max. electrode is ensured.

Level detection for max. signal

- Set the mode selection switch to mode A
- Connect the signal conditioning instrument to power supply
- Turn the potentiometer to position 0
- Fill the vessel until the max. electrode is covered approx. 1 cm by the product
- Turn the potentiometer slowly clockwise until the yellow signal lamp extinguishes

The max. electrode is now adapted to the conductivity of the medium i. e. the relay deenergises at max. level and the transistor blocks.

Level detection for min. signal

- Set the mode selection switch to mode B
- Connect the signal conditioning instrument to power supply
- Turn the potentiometer to position 10
- Empty the vessel until the min. electrode is covered approx. 1 cm by the product
- Turn the potentiometer slowly anticlockwise until the yellow signal lamp extinguishes

The min. electrode is now adapted to the conductivity of the medium, i. e. the relay deenergises at min. level and the transistor blocks.

Two-point control (min./ max.), mode A (overfill protection)

- At first, connect only ground and max. electrode to the signal conditioning instrument (terminals 1 and 3)
- Set the mode selection switch to mode A
- Connect the signal conditioning instrument to power supply
- Turn the potentiometer to position 0
- Fill the vessel until the max. electrode is covered approx. 1 cm by the product
- Turn the potentiometer slowly clockwise until the yellow signal lamp extinguishes
- Connect the min. electrode to terminal 2 of the signal conditioning instrument

The two-point control is now adapted to the conductivity of the medium, i.e. the relay deenergises at max. level and the transistor blocks.

This switching condition remains until the level falls below the position of the min. electrode, i.e. the relay energizes at min. level and the transistor conducts.

The relay deenergises again at max. level and the transistor blocks.

Two-point control (min./ max.), mode B (dry run protection)

- At first, connect only ground and max. electrode to the signal conditioning instrument (terminals 1 and 3)
- Set the mode selection switch to mode B
- Connect the signal conditioning instrument to power supply
- Turn the potentiometer to position 10
- Fill the vessel until the max. electrode is covered approx. 1 cm by the product
- Turn the potentiometer slowly clockwise until the yellow signal lamp extinguishes
- Connect the min. electrode to terminal 2 of the signal conditioning instrument

The two-point control is now adapted to the conductivity of the medium, i.e. the relay deenergises at max. level and the transistor blocks.

This switching condition remains until the level falls below the position of the min. electrode, i.e. the relay energizes at min. level and the transistor conducts.

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The relay deenergises again at max. level and the transistor blocks.

7 Maintenance and fault rectification

7.1 Maintenance

When used in the correct way, no special maintenance is required in normal operation.

7.2 Remove interferences

Causes of malfunction

A maximum of reliability is ensured. Nevertheless, faults can occur during operation. These may be caused by the following, e.g.:

- Measured value from sensor not correct
- Power supply
- Interference on the cables

Fault rectification

The first measure to be taken is to check the input and output signals. The procedure is described as follows. In many cases the causes can be determined this way and faults can be easily rectified.

24 hour service hotline

However, should these measures not be successful, call the VEGA service hotline in urgent cases under the phone no. **+49 1805 858550**.

The hotline is available to you 7 days a week round-the-clock. Since we offer this service world-wide, the support is only available in the English language. The service is free of charge, only the standard telephone costs will be charged.

Failure

? The red failure control lamp (LED) of the signal conditioning instrument lights

- Sensor not connected correctly

→ Check the electrical connection by means of the wiring plans

- Line break

→ Check the electrical connection cables from the probe to the signal conditioning instrument

- Resistance for line monitoring missing

→ Check if a 220 kΩ resistor is mounted in the sensor housing between terminals 1 and 2 or if the respective bridge to the fault message adjustment on the signal conditioning instrument is present.

→ You can find further information in chapter "*Set up - Failure adjustment, bridge*".

In Ex systems, make sure that the Ex protection is not influenced by the measuring instruments used.

? The signal conditioning instrument does not switch when the respective probe is covered or uncovered

- Conductivity of the product too low

→ Check if the conductivity value of your product is at least 7.5 µS/cm

7.3 Instrument repair

If a repair is necessary, please proceed as follows:

You can download a return form (23 KB) from our Internet homepage www.vega.com under: "*Downloads - Forms and certificates - Repair form*".

By doing this you help us carry out the repair quickly and without having to call back for needed information.

- Print and fill out one form per instrument
- Clean the instrument and pack it damage-proof
- Attach the completed form and, if need be, also a safety data sheet outside on the packaging
- Please ask the agency serving you for the address of your return shipment. You can find the respective agency on our website www.vega.com under: "*Company - VEGA worldwide*"

8 Dismounting

8.1 Dismounting steps

Take note of chapters "*Mounting*" and "*Connecting to power supply*" and carry out the listed steps in reverse order.

8.2 Disposal

The instrument consists of materials which can be recycled by specialised recycling companies. We use recyclable materials and have designed the electronics to be easily separable.

WEEE directive 2002/96/EG
This instrument is not subject to the WEEE directive 2002/96/EG and the respective national laws. Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points. These may be used only for privately used products according to the WEEE directive.

Correct disposal avoids negative effects to persons and environment and ensures recycling of useful raw materials.

Materials: see chapter "*Technical data*"

If you have no possibility to dispose of the old instrument professionally, please contact us concerning return and disposal.

9 Supplement

9.1 Technical data

General data	
Series	Module unit with plug-in socket for mounting on carrier rail 35 x 7.5 or 35 x 5 according to EN 50022
Weight	170 g (6 oz)
Housing material	Noryl SE100, Lexan 920A
Socket material	Noryl SE100, Noryl SE1 GFN3

Power supply	
Operating voltage	20 … 253 V AC, 50/60 Hz, 20 … 72 V DC
Max. power consumption	1.5 W (1 … 9 VA)
Fuse	
– Supply area	T 315 mA, 253 V
– Switching off possibility	min. 35 A at 253 V AC or 125 V DC

Sensor input	
Quantity	1 x level detection or 1 x pump control (min./max.)
Response resistor	1 … 200 kΩ adjustable
Parallel resistor for fault monitoring	220 kΩ
Measuring circuit	max. 5 V eff., max. 1 mA
Permissible line capacitance	1 x 100 nF or 2 x 70 nF with min./max. control
Switching hysteresis	15 %

Adjustment elements	
DIL switch block	for preadjustment of the integration time and mode
Potentiometer	for switching point adjustment
Control lamps in the front plate	
– Status indication operating voltage	Signal lamp green (LED)
– Status indication fault signal	Signal lamp red (LED)
– Status indication switching point control	Signal lamp yellow (LED)

Relay output	
Quantity	1
Mode	A/B switch (A - max. detection or overfill protection, B - min. detection or dry run protection)
Integration time	500 ms
Contact	1 spdt for each output
Contact material	AgNi, hard gold-plated

Turn-on voltage	≥ 10 mV DC, ≤ 253 V AC/DC
Switching current	≥ 10 µA DC, ≤ 3 A AC, 1 A DC
Breaking capacity	≤ 750 VA, ≤ 54 W DC

Transistor output

Number, function	1 output, synchronously switching with the relay
Galvanic separation	Floating
Maximum values	
– U_B	36 V DC
– I_B	≤ 60 mA
Transistor voltage loss (U_{CE})	approx. 1.5 V at I_B 60 mA
Inverse current (I_0)	≤ 10 µA

Ambient conditions

Ambient temperature	-20 … +60 °C (-4 … +140 °F)
Storage and transport temperature	-40 … +70 °C (-40 … +158 °F)

Electromechanical data

Screw terminals	for wire cross-section up to 1.5 mm² (AWG 16)

Electrical protective measures

Protection class	
– Signal conditioning instrument	IP 30
– Terminal socket	IP 20
Overvoltage category	II
Protection class	II
Electrical separating measures	reliable separation (VDE 0106, part 1) between power supply, sensor input, level relay and transistor output

Approvals[1)]

ATEX	ATEX II (1) G [EEx ia] IIC
Others	WHG Ship approval

[1)] Deviating data in Ex applications: see separate safety instructions.

9.2 Dimensions

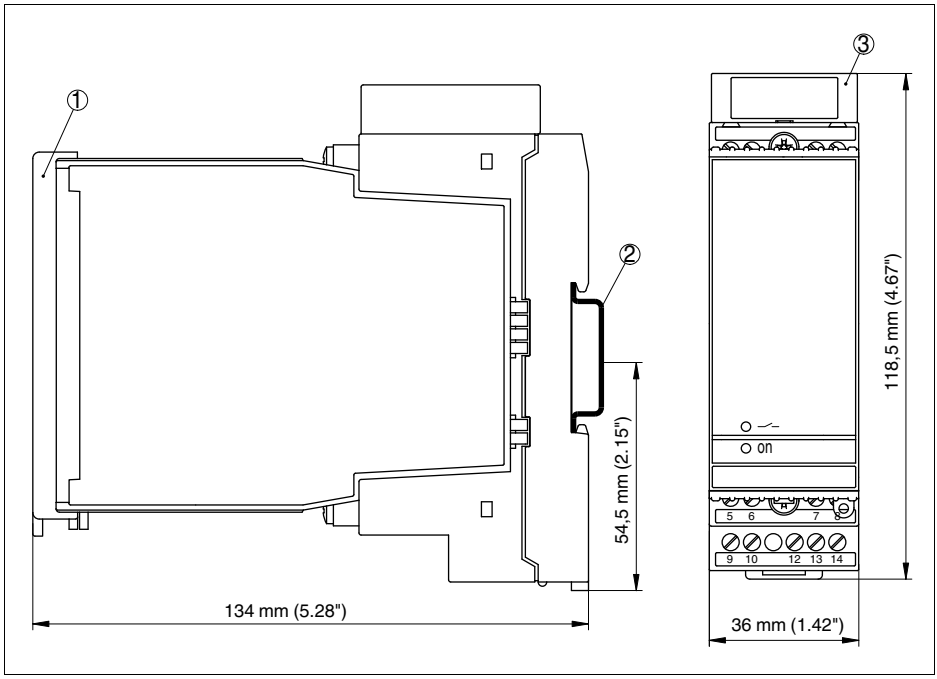

Fig. 16: Dimensions VEGATOR 631 Ex

1 Transparent cover
2 Carrier rail 35 x 7.5 or 35 x 15 according to EN 50022
3 Ex separating chamber

Printing date:

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All statements concerning scope of delivery, application, practical use and operating conditions of the sensors and processing systems correspond to the information available at the time of printing.

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